# The Impact of Trauma Exposure and Post-Traumatic Stress Disorder on Healthcare Utilization Among Primary Care Patients

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**Background:** Trauma exposure and post-traumatic stress disorder (PTSD) increase healthcare utilization in veterans, but their impact on utilization in other populations is uncertain.

**Objectives:** To examine the association of trauma exposure and PTSD with healthcare utilization, in civilian primary care patients.

**Research Design:** Cross-sectional study.

**Subjects:** English speaking patients at an academic, urban primary care clinic.

**Measures:** Trauma exposure and current PTSD diagnoses were obtained from the Composite International Diagnostic Interview. Outcomes were nonmental health outpatient and emergency department visits, hospitalizations, and mental health outpatient visits in the prior year from an electronic medical record. Analyses included bivariate unadjusted and multivariable Poisson regressions adjusted for age, gender, income, substance dependence, depression, and comorbidities.

**Results:** Among 592 subjects, 80% had ≥1 trauma exposure and 22% had current PTSD. In adjusted regressions, subjects with trauma exposure had more mental health visits [incidence rate ratio (IRR), 3.9; 95% confidence interval (CI), 1.1–14.1] but no other increased utilization. After adjusting for PTSD, this effect of trauma exposure was attenuated (IRR, 3.2; 95% CI, 0.9–11.7). Subjects with PTSD had more hospitalizations (IRR, 2.2; 95% CI, 1.4–3.7), more hospital nights (IRR, 2.6; 95% CI, 1.4–5.0), and more mental health visits (IRR, 2.2; 95% CI, 1.1–4.1) but no increase in outpatient and emergency department visits.

**Conclusions:** PTSD is associated with more hospitalizations, longer hospitalizations, and greater mental healthcare utilization in urban primary care patients. Although trauma exposure is independently associated with greater mental healthcare utilization, PTSD mediates a portion of this association.

**Key Words:** PTSD, trauma, primary care, hospitalization, utilization

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Trauma exposure can be described as an unexpected, violent encounter with nature, technology, or humankind.[1] Post-traumatic stress disorder (PTSD) is a syndrome after a significant trauma exposure characterized by persistent, recurrent symptoms including intrusive recollections, avoidance of disturbing stimuli and increased arousal, which cause significant functional impairment.[2]

Healthcare utilization data are essential for estimating the impact of specific medical conditions and for informing healthcare planning and policy.[3] Prior studies suggest that trauma exposure and PTSD have considerable impact on healthcare utilization and costs.[1,3–5] Most of this research has focused on male veterans and female sexual assault victims and reports increased healthcare utilization for mental and physical problems.[1,5–7] These findings may not be generalizable to other populations as the services available to veterans such as specialized PTSD clinics and disability compensation may differ from those available to civilians with PTSD.[3,7]

Trauma exposure and PTSD are common in primary care settings for nonveterans and veterans alike.[1,5,8–10] However, few studies have examined healthcare utilization patterns in this population.[2,11–16] The studies among veterans have generally shown increased use of mental healthcare services but conflicting findings in the use of services for physical health problems. As noted by Elhai and others in a recent review of healthcare utilization studies in trauma survivors, these studies have been limited by methodological concerns including not using diagnostic measures for PTSD,[2,13–16] small sample sizes,[2,11–14,16] lack of adjustment

for potential confounders of utilization,[2,11,13,14,16] and use of self-reported utilization measures,[11,12,14] which can be less accurate.[3,17] Data collected from electronic medical records (EMR) are considered to be more valid than self-reported utilization data.[3] Because these studies have mostly been conducted in populations with higher socioeconomic status, they may not be applicable to residents of urban, economically disadvantaged areas who may be both at greater risk for trauma exposure as well as more vulnerable to the effects of trauma.[12,15] Finally, most studies to date have not clarified whether health service use is independently affected by trauma exposure, subsequent development of PTSD, or both.

This study's objective was to examine the independent associations of both trauma exposure and PTSD with healthcare utilization in a civilian, urban primary care population and to examine any mediating role of PTSD in the relationship between trauma exposure and utilization. We hypothesized that urban primary care patients with trauma exposure or PTSD would have more nonmental health outpatient and emergency department visits, hospitalizations and mental health outpatient visits. We further hypothesized that any increases in utilization associated with trauma exposure would be explained in part by the presence of PTSD.

## METHODS

The current analyses were conducted as part of a cross-sectional study of PTSD and its comorbidities in primary care. We interviewed a sample of primary care patients at the outpatient department of an urban university-affiliated, safety-net hospital to examine overall prevalence of traumatic exposure and select behavioral health outcomes in addition to PTSD, including: major depression, substance dependence and chronic pain. A detailed description of the main study methods can be found elsewhere[9]; we summarize methods relevant to the current analyses below.

### Subjects

Patients presenting to the primary care (Internal Medicine and Family Medicine) clinics at an urban, academic safety-net medical center were eligible if they spoke English, were between the ages of 18 and 65 years and had a scheduled appointment with a primary care clinician. Patients were excluded if they could not be interviewed alone or if they did not seem to understand the study. After the first 509 consecutive patients were enrolled meeting all inclusion criteria, we limited enrollment to a "subsample" of eligible patients oversampled for alcohol and drug use and irritable bowel symptoms to permit preplanned subgroup analyses ("subsample" = 98 patients). The current analyses used the entire sample of 607. Boston University Medical Center's Institutional Review and HIPAA Privacy Review Boards approved the study. A Certificate of Confidentiality was obtained from the National Institutes of Health.

### Assessments

Interviewers screened consecutive patients arriving at the primary care clinic and eligible patients were asked to participate in an interview about stress and health after obtaining informed consent. The interview included demographic questions, the Composite International Diagnostic Interview (CIDI) version 2.1 PTSD module,[18] the Chronic Pain Definitional Questionnaire,[19] the Patient Health Questionnaire (PHQ) modules measuring depression diagnoses (major and other depression in past 2 weeks)[20] and the CIDI-Short Form (CIDI-SF) modules for drug and alcohol dependence in the past 6 months.[18] Enrollment took place from February 2003 to September 2005.

Using standardized data forms, trained researchers reviewed patient EMR to collect nonmental health outpatient and emergency department (ED) visits, hospitalizations and mental health outpatient visits. The EMR registration history records every single visit in all inpatient and outpatient locations of our comprehensive medical system, which provides most of our population's healthcare.

Study variable selection was guided by Andersen's behavioral model of health services use, a well validated and extensively used conceptual framework for healthcare utilization.[21] In this model, subjects use healthcare resources depending on their medical needs, which in turn may be influenced by predisposing and enabling factors. Need refers to actual illness, which is the most important determinant of healthcare use and we conceptualized trauma exposure and PTSD as need factors in our models. Comorbid medical illness and depression were also characterized as need factors because they could also influence healthcare use in patients. Predisposing factors influence the propensity of an individual to seek medical attention and we characterized age, gender, and substance dependence as predisposing factors. Finally, enabling factors enhance or impede use of healthcare; we characterized income, for example, as an enabling factor. Although health insurance status is often considered as an enabling factor, we did not include insurance status in our model as >99% of participants had coverage for the types of utilization studied via federal, state, or private insurance or through an uncompensated care pool ("free care").

*Independent variables* were: (1) trauma exposure defined using 11 questions (9 questions on specific types of traumatic events and 2 open ended questions on exposure) from the CIDI, a well validated and reliable diagnostic interview developed by the World Health Organization for diagnosing mental disorders based on DSM-IV criteria.[18] We first characterized trauma exposure as a dichotomous variable (none vs. one or more). We also characterized number of types of traumatic events as a class variable (0, 1–2, 3–4, ≥5 types of traumas) to assess a "dose-response" relationship between trauma exposure and utilization. The classes approximately divided the sample population into 4 quartiles; (2) diagnosis of current PTSD (past 12 months), characterized as a dichotomous variable, obtained by the CIDI.[18] *Dependent (outcome) variables* were counts of nonmental health outpatient visits involving any direct clinician contact, ED visits, inpatient hospitalizations for any reason, and mental health outpatient visits, for the 12 months before the research interview. We also counted the inpatient nights spent during hospitalizations as a proxy measure for the amount of inpatient resources used. Multiple visits on the same day to different clinicians were counted as discrete outcomes. Visits

for diagnostic testing were excluded. *Covariates* used in adjusted models included age, gender, annual income (≤ or >$20,000), substance dependence (drug and/or alcohol dependence in the past 6 months by CIDI-SF),[18] depression (major and/or other depression by PHQ),[20] and medical comorbidity measured by the Charlson Index (obtained from the diagnostic information in the EMR. Possible range of scores was 0–33. Higher scores indicate greater medical comorbidity).[22]

## Statistical Methods

All analyses used 2-tailed tests with a *P* value of ≤0.05 considered to indicate statistical significance. Descriptive and bivariate unadjusted analyses included $\chi^2$ tests to evaluate differences in proportions, *t* tests for differences between means for parametric data and Wilcoxon rank sum tests for differences between medians for skewed data. Multivariable adjusted analyses, to determine the independent associations between trauma exposure and PTSD with utilization included Poisson regression models accounting for overdispersion to obtain incidence rate ratios (IRR).[23] We used a Poisson regression because the utilization dependent variables are count measures with a skewed, nonparametric distribution, and therefore standard parametric approaches like linear regression are not statistically appropriate.[23] To determine whether PTSD mediated the relationship between trauma exposure and utilization, we fit 2 adjusted Poisson regression models, the first including trauma exposure and utilization outcome variables and the second adding the PTSD variable. To test whether the subsample of participants recruited for substance use and irritable bowel syndrome influenced findings, we fit another model excluding the subsample. The results were essentially unchanged and the data are not presented here. All analyses were done using SAS software, version 8.0.

## RESULTS

Of the 751 patients who met eligibility criteria for this study, 607 (81%) agreed to participate. The 144 subjects (19%) who refused did not differ significantly from study subjects in terms of age, gender, or race. Nonparticipants were more likely to be born outside the United States (41% vs. 21%, *P* = 0.001). The 98 subjects in the "subsample" did not differ significantly from other subjects in age, race, marital status, employment, income, and prevalence of PTSD. They had a greater prevalence of major depression (37% vs. 21%, *P* = 0.001) and trauma exposure (88% vs. 79%, *P* = 0.04). Medical record information was not available for 15 of the 607 subjects, leaving 592 subjects for analysis. See Table 1 for participant characteristics.

## Trauma Exposure

Eighty percent of subjects had one or more trauma exposures. Compared with subjects with no trauma exposure, subjects with trauma exposure were significantly more likely to be male (51% vs. 38%), unmarried (87% vs. 75%), have substance dependence (21% vs. 5%), and depression (48% vs. 33%).

**TABLE 1.** Characteristics of Primary Care Patients

| | Total, % (N = 592) | PTSD, % (N = 133) | No PTSD, % (N = 459) | *P* |
|---|---|---|---|---|
| Age (yr), mean ± SD | 41.6 ± 11.6 | 40.6 ± 10.7 | 41.9 ± 11.8 | 0.3 |
| Female gender | 51 | 62 | 48 | 0.007 |
| Ethnicity* | | | | 0.8 |
| Black | 59 | 56 | 60 | |
| White | 19 | 18 | 19 | |
| Hispanic | 8 | 10 | 8 | |
| Other | 14 | 16 | 14 | |
| Married | 15 | 11 | 16 | 0.10 |
| Education* | | | | 0.2 |
| <High school | 25 | 30 | 23 | |
| High school | 34 | 34 | 34 | |
| College | 41 | 36 | 43 | |
| Annual Income* | | | | <0.0001 |
| ≤$20,000 | 50 | 68 | 46 | |
| >$20,000 | 50 | 33 | 55 | |
| Drug and/or alcohol dependence past 6 mo* | 18 | 24 | 16 | 0.04 |
| Major and/or other depression | 45 | 71 | 37 | <0.0001 |
| Comorbidity— mean ± SD*† | 0.66 ± 1.29 | 0.66 ± 1.36 | 0.66 ± 1.26 | 0.9 |

*No. patients for whom data not available: ethnicity = 1, education = 2, income = 18, substance dependence = 4, comorbidity = 1.

†As measured by the Charlson Comorbidity Index. Range of scores in this group of subjects was 0–9.

**TABLE 2.** Unadjusted Association of PTSD With 12-Month Utilization (N = 592)

| | PTSD (N = 133) | No PTSD (N = 459) | *P* |
|---|---|---|---|
| Outpatient visits* | 9.16 ± 9.74 (7) | 8.35 ± 9.95 (5) | 0.10 |
| ED visits* | 1.88 ± 3.28 (1) | 1.41 ± 2.76 (1) | 0.2 |
| Hospitalizations* | 0.43 ± 1.32 (0) | 0.18 ± 0.57 (0) | 0.05 |
| Inpatient nights* | 2.99 ± 14.88 (0) | 1.01 ± 4.34 (0) | 0.08 |
| Mental health visits* | 1.41 ± 4.74 (0) | 0.5 ± 2.39 (0) | <0.0001 |

*Mean ± SD (median).

In bivariate unadjusted analyses, subjects with trauma exposure had more mental health visits (mean 0.83 vs. 0.18, median 0 vs. 0, *P* = 0.005) and emergency department visits (mean 1.55 vs. 1.37, median 1 vs. 0, *P* = 0.03) compared with subjects with no trauma exposure. In multivariable adjusted analyses (Table 3),), subjects with trauma exposure had 3.90 times more mental health visits in 12 months compared with patients with no trauma exposure (IRR, 3.90; 95% CI, 1.08–14.14). This association was attenuated and no longer statistically significant after PTSD was added as a covariate in this model (IRR, 3.16; 95% CI, 0.85–11.69). Subjects with trauma exposure did not have more outpatient visits (IRR, 1.10; 95% CI, 0.89–1.40), ED visits (IRR, 1.07; 95% CI, 0.71–1.60) or hospitalizations (IRR, 0.94; 95% CI, 0.49–1.77).

**TABLE 3.** Incidence Rate Ratios of PTSD and Trauma Exposure With Prior 12-Month Utilization*

|  | PTSD† (95% CI) | Trauma Exposure‡ (95% CI) |
| --- | --- | --- |
| Outpatient visits | 1.04 (0.84–1.28) | 1.10 (0.89–1.40) |
| ED visits | 1.07 (0.75–1.54) | 1.07 (0.71–1.60) |
| Hospitalizations | 2.22 (1.35–3.67) | 0.94 (0.49–1.77) |
| Inpatient nights | 2.62 (1.38–4.99) | 0.84 (0.36–1.95) |
| Mental health visits | 2.15 (1.14–4.06) | 3.90 (1.08–14.14) |

*Poisson regressions adjusted for age, gender, income, substance dependence, depression, and comorbidity.

†Total no. subjects available for analyses = 570; reference group for IRR is no PTSD.

‡Total no. subjects available for analyses = 577; reference group for IRR is no trauma exposure.

We found a similar pattern of results when we studied trauma exposure severity by characterizing it as a 4-class variable (0, 1–2, 3–4, ≥5 types of trauma). For example, subjects with ≥5 types of trauma had significantly more mental health visits (IRR, 3.19; 95% CI, 1.22–8.34) when compared with subjects with no traumas, but this association was attenuated and no longer significant after PTSD was added as a covariate in this model (IRR, 2.06; 95% CI, 0.69–6.20).

## PTSD

Among the 592 subjects, 133 (22%) had current PTSD. Mean duration of PTSD was 11.9 years (median = 7.9 years) and 94% of subjects had PTSD symptoms for 11 months or more. Compared with subjects without PTSD, subjects with PTSD were significantly more likely to be female (62% vs. 48%), to have an annual income less than or equal to $20,000 (68% vs. 46%), to meet criteria for substance dependence (24% vs. 16%) and depression (71% vs. 37%) (Table 1). In bivariable unadjusted analyses (Table 2), subjects with PTSD had significantly more hospitalizations (mean number 0.43 vs. 0.18, median 0 vs. 0, $P = 0.05$) and mental health visits (mean 1.41 vs. 0.50, median 0 vs. 0, $P < 0.0001$) in the prior 12 months than did subjects without PTSD. Although not reaching conventional levels of statistical significance, subjects with PTSD tended to spend more nights in the hospital (mean 2.99 vs. 1.01, median 0 vs. 0, $P = 0.08$) and higher outpatient (mean 9.16 vs. 8.35, median 7 vs. 5, $P = 0.10$) and emergency department visits (mean 1.88 vs. 1.41, median 1 vs. 1, $P = 0.16$). In multivariable adjusted analyses (Table 3), compared with subjects without PTSD, subjects with PTSD had 2.22 times more hospitalizations (IRR = 2.22, 95% CI = 1.35–3.67) and spent a greater number of nights in the hospital (IRR = 2.62, 95% CI = 1.38–4.99). They had 2.15 times more mental health visits (IRR = 2.15, 95% CI = 1.14–4.06). They did not have more outpatient visits (IRR = 1.04, 95% CI = 0.84–1.28) or ED visits (IRR = 1.07, 95% CI = 0.75–1.54).

## DISCUSSION

Among urban primary care patients, PTSD is associated with greater healthcare use: both mental health visits and hospitalizations. Unexpectedly, trauma exposure by itself was not associated with increased utilization, apart from mental health visits, a finding which was attenuated after adjusting for PTSD.

The burden of depression alone on increased utilization of healthcare resources is well characterized. However, there is some controversy as to the incremental burden of anxiety disorders such as PTSD in primary care patients.[24] Our study confirms the increased mental healthcare use by PTSD patients seen in most prior studies in civilian primary care populations.[2,11,12,14,15] Although this is not surprising, our study highlights the additional burden of mental illness due to PTSD that persists even after accounting for the various comorbid medical conditions and depression that affects this population.

Our finding of greater use of inpatient but not of ED or outpatient resources contributes to the few prior studies in this area. These studies have found inconsistent results when reporting about healthcare use for physical problems in civilian primary care patients.[2,11–16] Stein et al found greater self-reported hospitalizations by patients with PTSD in a bivariate unadjusted analysis of approximately 18 primary care patients with PTSD compared with 74 patients without psychiatric disease, whereas Walker et al did not find increased hospitalization costs in a group of female HMO patients with PTSD.[14,15] However, the higher socioeconomic status of their HMO population may reflect healthier patients with more resources to avoid hospitalization.[15] Although Stein et al found increased ED use, the larger study by Walker et al did not find an association between PTSD and ED costs, which is consistent with the nonsignificant association we found between PTSD and ED visits.[14,15] To our knowledge, no other additional studies besides these 2 have examined the association between PTSD and use of inpatient and ED resources in nonveteran primary care patients.[14,15] A few studies have looked at nonmental health outpatient utilization in PTSD, but all of these studies had methodological limitations.[2,11,14–16] We did not find the increased use of outpatient resources seen in these studies. This may also reflect the overall high use of outpatient care by our patients, particularly because a study entry criterion was use of primary care. Taken collectively, our data suggest a pattern of increased use of healthcare resources for both mental and physical illness in urban primary care patients with PTSD, similar to the increased utilization seen in veterans.

There may be a number of potential pathways that explain increased utilization of health services for physical illness by some patients with PTSD. PTSD and trauma survivors have a higher prevalence of cardiac, digestive, musculoskeletal, nervous system, endocrine, and other physical illness; abnormal hypothalamic pituitary and sympathetic-adrenal-medullary axes; higher circulating T-cell counts; and immunoglobulin-M levels with lower cortisol and dehydroepiandrosterone levels, all of which strongly suggest an underlying deleterious biologic response to stress.[1,25] One could hypothesize that individuals can have varying psychologic responses to trauma such as high risk behaviors, medically unexplained somatic symptoms and marked physical and emotional functional impairment, all of which could increase their risk of hospitaliza-

tion.[1,24,26] Clinicians in turn commonly fail to recognize PTSD or may mistake somatization symptoms as manifestations of physical illness resulting in unnecessary tests and hospitalizations.[7–9] Notably, these responses can be sustained—over one-third of patients with PTSD have persistent symptoms after 10 years.[5]

Importantly, trauma exposure alone was not associated with any utilization for physical problems, an unexpected finding. In the one area in which we did find increased utilization with trauma exposure, that of mental healthcare, PTSD attenuated this association. Given that 80% of our study subjects were exposed to at least one type of trauma, it is possible that any other differences in utilization secondary to trauma may be masked in this highly traumatized population. Prior studies have consistently shown greater utilization with specific traumas such as criminal or sexual assault; whereas we did not attempt to distinguish between different types of trauma, suggesting that all trauma exposures may not be equal.[5] Finally, other factors besides exposure to trauma alone may be necessary to influence healthcare seeking behavior. Although some trauma survivors may be resilient and avert the deleterious effects of trauma, others may be more vulnerable; we did not attempt to characterize these differences. Similarly, development of PTSD after trauma exposure may be one of the pathways mediating healthcare use.[16] This is supported by our findings that adjusting for the effect of PTSD attenuated the association of trauma exposure with increased mental healthcare utilization.

Limitations of this study include its cross-sectional design that precludes determination of causality of the association between PTSD or trauma exposure and utilization. However, it seems less likely that an increased use of medical resources would result in significant PTSD or trauma. Although, like almost all other similar studies we could not prospectively assess utilization in our patients, prior utilization is a powerful predictor of future utilization and may suggest continued greater use of resources by patients with PTSD.[15,27] The prevalence of PTSD was higher in this primary care population than noted in previous community studies. Although this may limit the generalizability of these results to other settings, it is certainly applicable to other urban hospitals that provide a large proportion of care for medically underserved populations with similar illness burdens. Although our EMR does not capture utilization outside the medical center, our comprehensive medical care system provides the majority of care for our population. Additionally, all our subjects had an established primary care provider at our medical center making it more likely they would get their healthcare within our system.

The relationship between trauma/PTSD and utilization has historically been studied in victims of combat and sexual assault, whereas almost no prior studies have been in urban, minority, disenfranchised community populations with a heavy burden of trauma like our subjects.[1,4] Although it may be expected that trauma and PTSD may not have an incremental effect on utilization in such populations given that participants have multiple other reasons for high utilization, our findings suggest that even on top of poor social conditions, PTSD impacts healthcare utilization. Furthermore, to our knowledge, no other study has addressed the serious methodological concerns of prior studies in this population—including lack of diagnostic criteria for PTSD, failure to adjust for medical and psychosocial factors known to affect utilization, and self-reported utilization data.[3] We confirmed the robustness of our trauma exposure findings by studying the effects of both the presence of trauma as well as the severity of trauma on utilization. Additionally, as pointed out by Hidalgo et al, other studies have not distinguished between PTSD and trauma exposure in the effect on healthcare utilization.[1] Our results suggest that future studies of utilization should account for development of PTSD in trauma survivors and that in poor urban clinical samples, trauma alone may not account for changes in utilization. This is also one of the largest studies to date to comprehensively study the patterns of healthcare utilization among primary care patients with PTSD in a nonveteran setting. Most prior community studies were done in HMO populations with higher socioeconomic status and our findings are applicable to other urban medical settings, which also have a large, similar trauma burden.[9,15] Our study thus contributes estimates of healthcare utilization secondary to trauma exposure in a population where trauma is extremely common, seldom recognized, and consequences are largely unknown.[1,4,9] Such estimates are critical to help policymakers and providers allocate and evaluate effectiveness of scarce healthcare resources.[1,4]

We conclude that in an urban, primary care population, PTSD is independently associated with a doubling of the number of hospitalizations and over twice the utilization of mental health resources. PTSD is not associated with more outpatient or ED visits. Although trauma exposure is associated with nearly four times the utilization of mental health resources, it seems that this effect may be partially mediated by PTSD. Trauma exposure alone does not seem to be associated with greater use of health resources for physical illness. Future studies of trauma survivors in health care settings should consider the use of available PTSD screening tools such as the PTSD Checklist to identify those who may benefit most from targeted allocation of resources.[28] Although the burden of depression on use of medical resources is well known, policymakers and clinicians are less aware of this significant impact of PTSD on use of medical services, particularly in nonveteran settings. Future, well-designed studies are required to prospectively determine both the mechanisms of how PTSD may contribute to utilization and if this additional utilization is appropriate. Effective treatment options now exist for PTSD[29]; thus, earlier efforts at detection and treatment in the primary care setting can be explored as a potential path to reduce both appropriate and inappropriate hospitalizations.

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